

Competitive Analysis

Mylex DAC960PJ
AMI Series 434

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Introduction

The purpose of this document is to present a product comparison between the Mylex DAC960PJ and the AMI MegaRAID Series 434 RAID controllers.

Because the AMI 434 controller is targeted at the server segment of the PC market, the performance analysis contained in the first part of this document will concentrate on this environment. A detailed feature comparison is included in the second part.

Performance Analysis

File and application servers predominantly use RAID level 5 when it is available. RAID 5 provides the best efficiency in performance and capacity, with full protection from single drive failures.

The benchmark data contained in this document focuses on providing the RAID 5 performance data necessary to set up the best real world server solution. Every effort has been made to ensure that the optimal configuration resulting in the best performance numbers was used for both RAID controllers.

Benchmark Configuration

Benchmark programs measuring an I/O subsystem generally does one of two things:

- measure how the I/O subsystem performs in a simulated application environment, taking into account the overhead that it might impose on the overall system
- measure the performance characteristics of an I/O subsystem in very specific terms, such as sequential or random I/O.

This document presents the performance data on Windows NT using **Ziff-Davis ServerBench** for the application benchmark test and **Intel Galileo** for the performance characteristics benchmark test.

ServerBench is a popular industry-standard benchmark program measuring how a server performs with multiple copies of application loads using many client workstations to drive the workload. Galileo, on the other hand, is a test and measurement tool, allowing a multitude of settings to measure and fine tune the performance of an I/O subsystem. Galileo is used here to measure the raw characteristics of the controllers. Both tests run under Windows NT 4.0.

Compaq Proliant 5000 with dual-Pentium Pro 200MHz CPU was chosen as the server test platform, since its configuration reflects what is predominant in the market for server platforms. The Compaq system consists of an 8-drive RAID 5 disk array across two

channels. Forty-eight (48) client workstations were used additionally for the ServerBench test run.

Both of the RAID controllers were configured using their best-optimized settings (see Controller Configuration.)

Server Configuration	
System	Compaq Proliant 5000 (BIOS E16 5/12/97) Dual Pentium Pro 200MHz 256MB Memory, 512KB L2 Cache
Drives	Eight (8) Seagate ST19101WC Spread evenly over two SCSI channels
Network Adapters	3 - Intel 82557-based 10/100 Ethernet PCI Adapter Device Driver Ver. 2.0
Operating System	Windows NT 4.0 Server, Service Pack 3
Benchmark Programs	Ziff-Davis ServerBench Ver. 4.0 Intel Galileo Ver. 8.20.97

Client Configuration	
System	32 Workstations - Intel Pentium 75MHz, 8MB Memory 16 Workstations - Intel Pentium 90MHz, 16MB Memory
Network Adapters	1 - 3COM 3C509
Operating System	Windows 95, Ver. 4.00.950a

Controller Configuration

One approach to benchmarking two RAID controllers is to keep all the default settings and just run the benchmark program. Another approach is to compare the best-optimized case for both controllers and compare them using settings that might be used in actual tuned systems. Though definitely more time-consuming and more complex, the optimized settings were used in this comparison.

On the AMI 434, several settings were changed to get the best numbers. The default values of 8KB stripe block size, read-ahead cache policy, and write-through caching were changed to 16KB stripe block size, normal read cache policy, and write-back caching. The changes resulted in significant improvements over the default settings for the AMI 434.

On the Mylex DAC960PJ, the write-through cache policy was changed to write-back. In general, RAID vendors disable the write-back cache by default. Write-back cache normally provides the best performance but requires an optional battery backup unit to protect against possible loss of write-buffered data, in case of power failure.

As an additional note, Mylex cache size was kept at the default 8MB, whereas AMI is tested with 16MB.

Mylex DAC960PJ	
Firmware	4.03
Optimal Configuration	8MB EDO/ECC Memory * 64KB Stripe Block Size * 8KB Cache Segment * Write Back Enabled
Windows NT Driver	DAC960NT.SYS Ver: 4.10 Date: 8-15-97

AMI MegaRAID 434	
Firmware	Xm75
Configuration	16MB EDO Memory (1x16MB) * 16KB Stripe Block Size Read Policy Normal Write Back Enabled Cache Policy Direct I/O *
Windows NT Driver	MRAID35X.SYS Date: 3-5-97

* Default setting

Benchmark Results

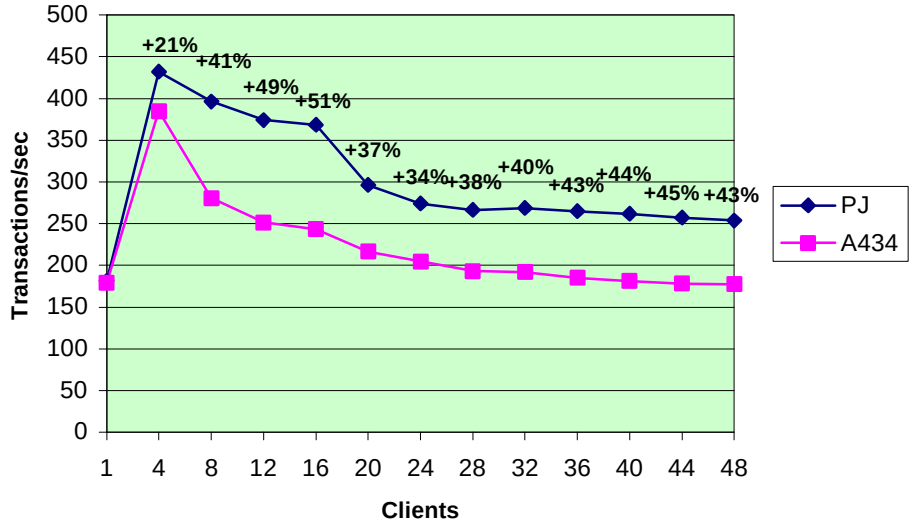
ServerBench

Results are displayed in transactions/sec for 1 to 48 clients. Additionally, ServerBench performance under degraded mode is provided. The degraded mode performance chart presents how the system will perform in a drive failure condition.

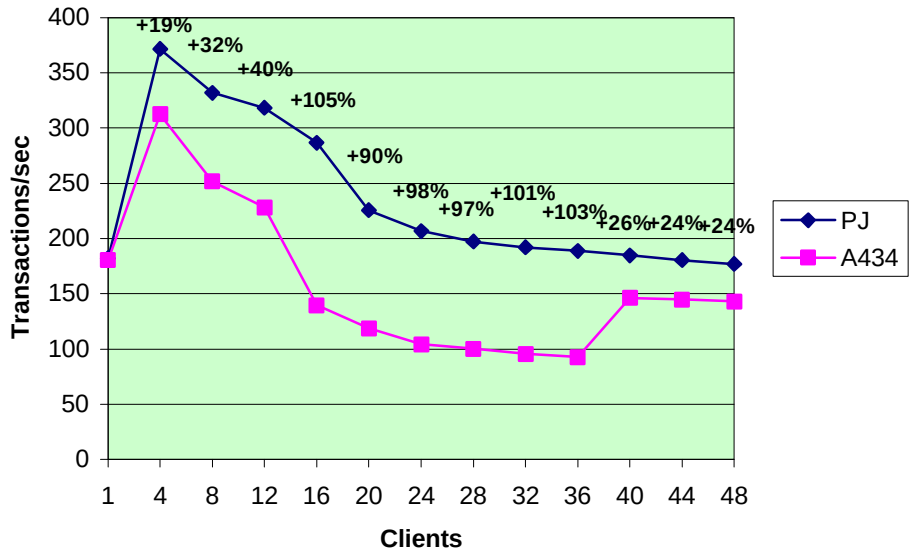
Please refer to *ServerBench Overview* in Appendix A for more information on the ServerBench benchmark output.

RAID 5 – ServerBench

Normal Mode



Degraded Mode



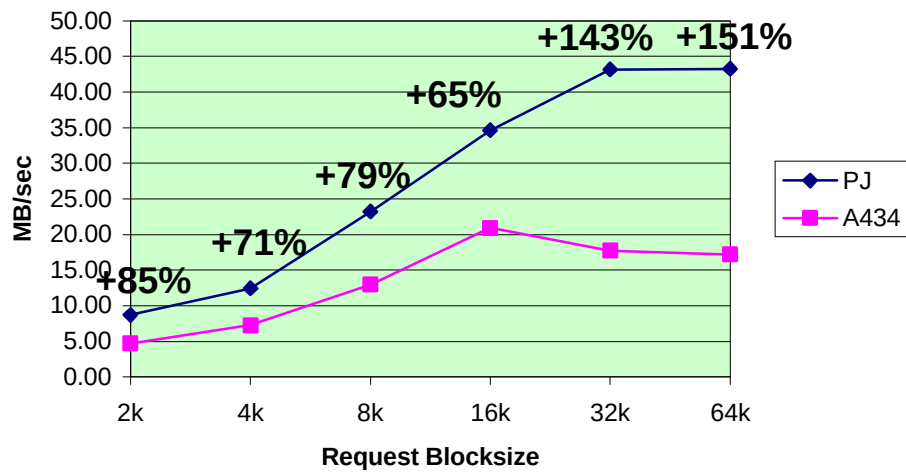
Note that the test performed for this document is without independent verification by Ziff-Davis. Ziff-Davis makes no representations or warranties as to the results of the test.

Galileo

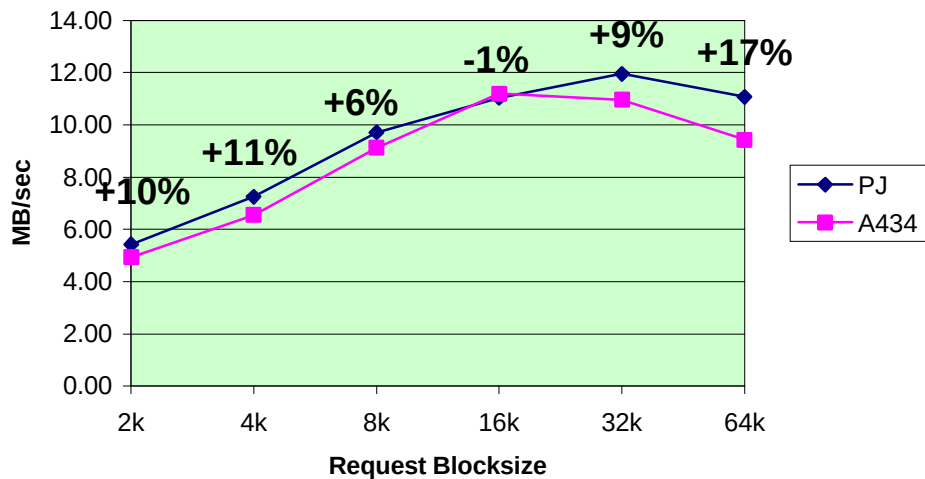
Galileo uses a raw partition to perform its measurements to avoid file system overhead. Measurements are taken at 2K, 4K, 8K, 16K, 32K, and 64K blocksize requests. Sequential I/O results are displayed in megabytes/sec. Random I/O results are displayed in IO/sec.

Please refer to *Galileo Overview* in Appendix B for more information on the Galileo tool.

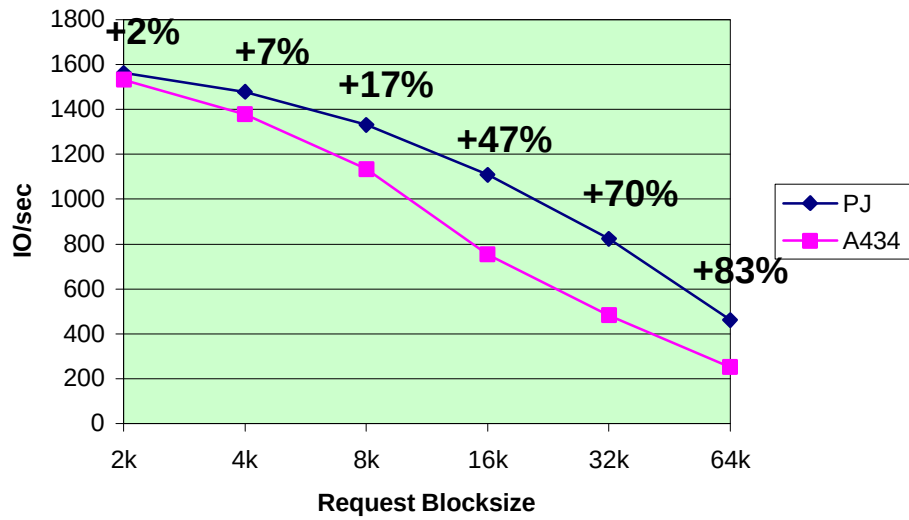
RAID 5 – Sequential Read



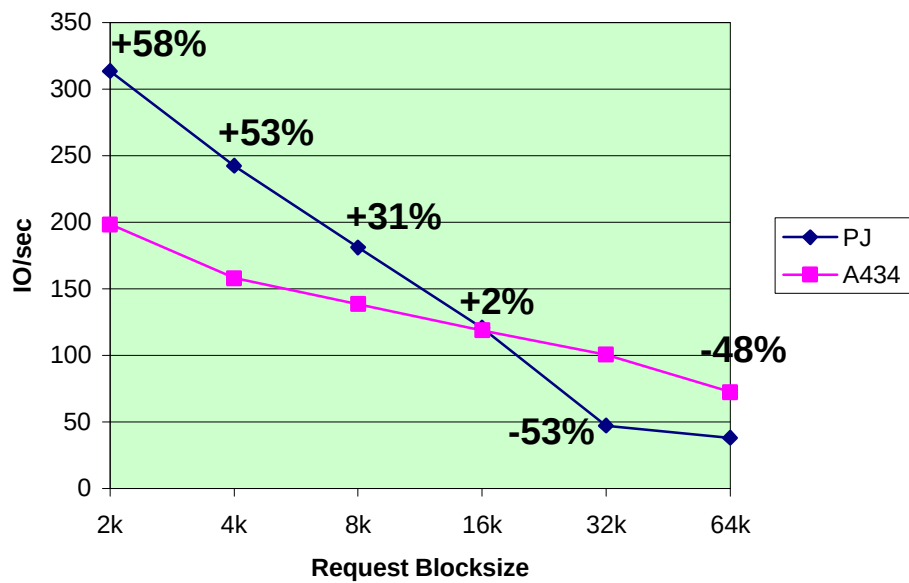
RAID 5 – Sequential Write



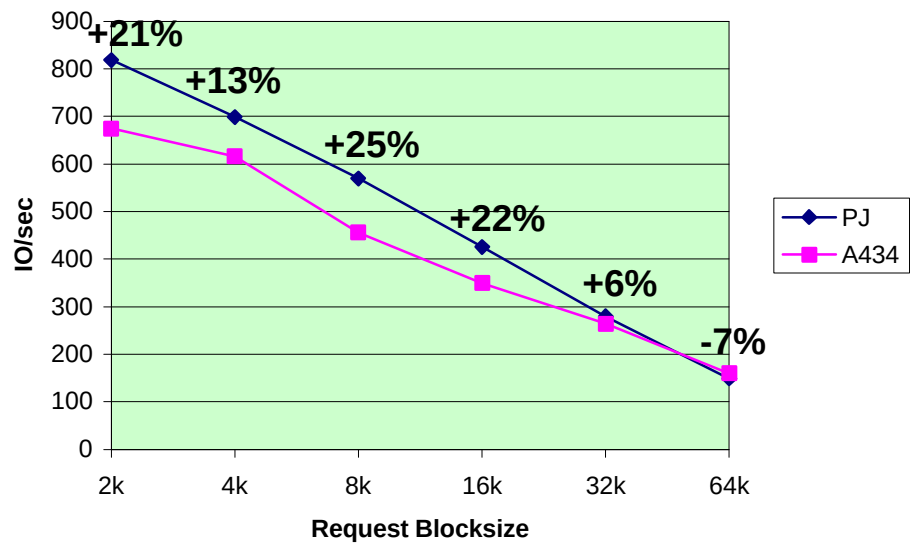
RAID 5 – Random Read



RAID 5 – Random Write



RAID 5 – Random Read 75% / Write 25%



Feature Comparison

General Features	Mylex DAC960PJ	AMI MegaRAID 434
Processor	i960RD	i960CF
Speed	66 MHz	33 MHz
Host Bus Interface	PCI 2.1	PCI 2.1
Bus Master Rate	132 MB/s	132 MB/s
Cache	EDO, 4 - 128 MB	EDO, 4 - 256 MB
ECC Protected Memory	Yes	No
Onboard SIMM Socket	1	2
Battery Backup for Cache (Hours)	72	72

SCSI Features	Mylex DAC960PJ	AMI MegaRAID 434
SCSI Processor	Mylex BA-81C15	Symbios 53C875
SCSI Interface	Ultra/Wide	Ultra/Wide
SCSI Data Rate (MB/s)	40	40
SCSI Channels (Max)	3	3
Internal	3	3
External	2	2
SCSI Devices Per Channel	15	15
Queue Tags Supported	256	256

RAID Features	Mylex DAC960PJ	AMI MegaRAID 434
Supported RAID Levels	0, 1, 3, 5, 0+1, 00, 10, 30, 50, JBOD	0, 1, 3, 5, 00, 10, 30, 50, JBOD
Backup Boot Block	Yes	No
Direct I/O	Yes	Yes
Drive Roaming	Yes	Yes
Dynamic Sector Repairing	Q1'98	No
Hot Spare Support	Yes	Yes
Max Spares	43	
Hot Swap Support	Yes	Yes
Maximum Logical Drives	32	
Maximum Capacity Per Logical Drive	2 TB	
Parity Calculation Method	Hardware	Hardware
Scatter/Gather Segments	33	
Stripe Size Supported (KB)	8, 16, 32, 64	2, 4, 8, 16, 32, 64, 128
Cache Line Supported (KB)	2, 4, 8, 16, 32, 64	

RAID Management	Mylex DAC960PJ	AMI MegaRAID 434
Background Consistency Check	Yes	Yes
Background Initialization	Q1'98	No
BIOS Configuration Utility	Q1'98	Yes
Cache Line Size Control	Yes	No
DMI Instrumentation	Yes	No
Drag 'n Drop Configuration	Yes	No
Drive Rebuild Rate	Configurable	Configurable
Enclosure Management	Yes	Yes
Fault Bus Support (StorageWorks)	Yes	Yes
SAF-TE	Yes	Yes
Error Logging	Yes	Yes
Event Logging	Yes	Yes
Fault Management	Yes	Yes
Client Interface	Yes	Yes
TCP/IP	Yes	No
Pager	Yes	Yes
Visual Icon	Yes	Yes
Fax	Yes	Yes
DMI	Yes	No
SNMP	Yes	Yes
GUI Client Utility	Yes	Yes
Windows 9x	Yes	Yes
Windows NT	Yes	Yes
GUI Stand-alone Utility	Q1'98	Yes
Network Security Levels	Yes	No
Guest Access	Yes	No
Admin Access	Yes	No

Online Capacity Expansion	Yes	Yes
Online RAID Level Migration	Q1'98	Yes
OS-Independent Server API	Yes	No
Performance Monitoring	Yes	
Controller Statistics	Yes	
Drive Statistics	Yes	
Historical Statistics	Yes	
Remote Instrumentation	Yes	No
DMI	Yes	No
SNMP	Yes	Yes
SCSI Host Bus Adapter Management	Yes	No
SCSI-to-SCSI RAID Management over SCSI Host Bus Adapter	Yes	No
SMART (Self Monitoring Analysis and Reporting Technology)	Yes	Yes
Wizard Configuration	Yes	No

<i>Operating Systems Supported</i>	Mylex DAC960PJ	AMI MegaRAID 434
DOS	Yes	Yes
Netware 3.x, 4.x	Yes	Yes
OS/2 2.x, Warp	Yes	Yes
SCO OpenServer	Yes	Yes
SCO UnixWare 2.x	Yes	Yes
Windows NT	Yes	Yes
Windows NT Enterprise Edition Clustering	Q1'98	Yes
Solaris (x86)	Yes	Yes

Appendices

Appendix A - ServerBench 4.0 Overview

The following excerpt from Ziff-Davis "The ServerBench Quick Start Handbook" (from <http://www1.zdnet.com/zdbop/svrbench/svrbench.html>) offers a brief description of ServerBench and its output measurement. ServerBench® is a registered trademark or trademark of Ziff-Davis Inc. in the U.S. and other countries.

Quick reminder of what ServerBench is:

ServerBench is a Ziff-Davis benchmark program that measures the performance of application servers in a client/server environment. It provides you with an overall score for your server and individual scores for the clients, which are PCs running Windows® 95 or Windows NT®. You start and monitor the test runs from the controller, which is a PC running Windows 95 or Windows NT.

The units ServerBench uses to report its scores

ServerBench reports its results as TPS, or transactions per second. Each client measures how long each transaction takes and how many transactions take place. The client calculates its TPS score by dividing the total number of transactions by the time they took to complete. ServerBench combines the individual client TPS scores and, using a harmonic mean, calculates the overall server score.

If you run the standard system test suite, ServerBench provides you with an overall measure of your server's performance. If you run one of ServerBench's subsystem test suites, the results you get will tell you how well that server subsystem is performing.

The higher the score, the better your application server performed.

Here's what makes up a transaction

A transaction consists of the request a client sends to the server, the response it gets back, and the time it takes from the moment the client sends the request until it receives a reply from the server. ServerBench includes the time the transaction spends:

- Traveling along the network to and from the server.
- Waiting in a queue on the server to receive a service.
- Receiving the service. For example, if the transaction requires disk service, this is the amount of time the disk took to provide the service.

Additional Information:

Once the client receives a response from the server and stops its transaction timer, the client validates the response. This validation does not cause any overhead on the server and is not included in the test time.

How ServerBench measures performance

ServerBench uses a weighted harmonic mean to calculate the overall score for your server. By using a harmonic mean, ServerBench can combine the scores for the different transactions to create a single representative score. ServerBench weights the different transactions based on how often the clients request that transaction in one iteration of a mix.

To determine the overall server TPS scores it produces, ServerBench:

- Tracks the amount of time each transaction takes to complete.
- Tallies the number of completed transactions. ServerBench does not count incomplete transactions or transactions that began during the Ramp up or Ramp down periods.
- Creates a total TPS score for each transaction by adding together the TPS score for each client. Uses a weighted harmonic mean to turn the total TPS scores into an overall score.

Appendix B - Galileo Overview

The results in this document were obtained using Galileo version 8.20.97, copyright 1997 by Intel Corporation. Intel does not endorse any Galileo results. More information about Galileo can be obtained by sending a message to galileo@co.intel.com.